

## **Reconstructing Precipitation Fields from the Historical Record: Think Globally, Act Locally**

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### **Abstract**

The historical precipitation record for the coterminous US consists of approximately 12,000 stations over 100 years. Although the data is highly irregular in both spatial and temporal sampling, the goal is to create high resolution monthly spatial fields that are useful for forcing ecological models or as inputs for other experiments. In this work we describe statistical methods for generating valid ensembles, or in Bayesian terms, approximate sampling from the posterior distribution. Traditional spatial statistics methods break down when brought to bear on such a large and nonstationary problem. The key to our approach is to efficiently blend sample covariance information from station pairs with large scale parametric models for the precipitation fields. Also the spatial analysis is done locally to reduce the computational order but unlike windowed Kriging we accumulate local results to give a single unified spatial model. One surprising result is that a first infilling missing station data turns out to be a productive intermediate step in computing an ensemble member evaluated on an arbitrary grid.